

REMARKS

Claims 1-31 are pending in the application. Claims 1-31 stand rejected.

Claim Rejections- 35 U.S.C. § 112, second paragraph:

Claims 1, 14, 23 are rejected 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention because the “ground rule design” is not defined by the specification.

Applicants respectfully traverse the rejection because the term “ground rule design” (or critical dimension) is a term of art that is extremely well known to those of ordinary skill in the art to mean a minimum feature size or minimum design distance. With respect to the present application, those of ordinary skill in the art would undoubtedly understand “ground rule design of 175 nm or less” to pertain to the width of a trench. Thus, the term “ground rule design” does not render the claims indefinite.

Further, in the context of claims 1, 14, and 23, the specification discloses on page 2, lines 15-17, “[t]his is believed to be a bottleneck that impedes trench etching deeper than ~7um, especially for 175 nm ground rules and below,” which also supports the claim language. (See also page 3, lines 15-16, and page 9, lines 3-4). Accordingly, withdrawal of claim rejection is respectfully requested.

Claim Rejections- 35 U.S.C. § 103(a)

Claims 1-31 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Singh et al. (U.S. Patent 6,042,687) in view of DeOrnellas et al. (U.S. Patent 6,046,116) and further in view of Yang (U.S. Patent 5,827,437) and Muller et al. (U.S. Patent 5,605,600).

It is respectfully submitted that at the very minimum the combination of Singh,

DeOrnellas, Yang, and Muller is legally deficient to establish a prima facie case of obviousness under 35 U.S.C. §103(a) to support the rejection of claims 1, 14, and 23 because the combination does not teach or suggest *etching deep trenches in a silicon substrate...wherein the deep trenches have a depth of about 8um or greater and wherein the deep trench etching is performed for a ground rule design of 175nm or less*, as essentially claimed in claims 1, 14, and 23.

Advantageously, the methods of claims 1, 14, and 23 enable the formation of deep trenches having depths that are not obtainable using conventional deep trench etching methods due to the accumulation and re-deposition of etch by-products that cause, *inter alia*, trench “pinch-off” and impedes the formation of a deep trench, especially for 175nm ground rules and below.

The Examiner acknowledges that neither Singh, DeOrnellas, nor Yang teach a method for etching deep trenches in a substrate that have an etching depth of about 7um or greater.

Applicants respectfully submit that Muller does not cure the deficiencies of Singh, DeOrnellas, or Yang because Muller does not disclose or suggest *etching deep trenches in a silicon substrate...wherein the deep trenches have a depth of about 8um or greater and wherein the deep trench etching is performed for a ground rule design of 175nm or less*.

Further, Applicants respectfully submit that at the very minimum, one of ordinary skill in the art would not be motivated to combine Muller with Singh, DeOrnellas, and Yang to derive the claimed inventions. Muller discloses etching trenches while heating the wafer to about 130°C (see FIG. 3). Muller also discloses that the heating of the wafer to 130°C happens in the first minute of the etching process and then remains fairly constant over the remaining duration of the etching process (see Col. 3, lines 63 –66). Whereas, the claimed invention includes heating

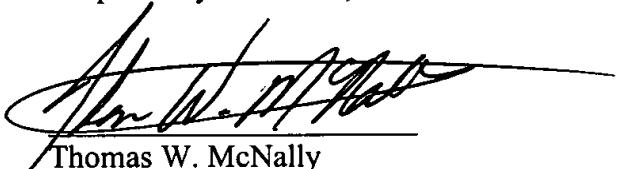
the wafer to temperatures of above 200 degrees Celsius which, as explained in Applicants' disclosure, eliminates the re-depositing of etch by-products from accumulating at the top of the deep trench to prevent trench "pinch-off." Muller does not address these problems.

Therefore, claims 1, 14, and 23 are believed to be patentable and non-obvious over the combination of Singh, DeOrnellas, Yang, and Muller. Further, all pending claims that depend from claims 1, 14, and 23 are believed to be non-obvious and patentable over such combination at least for the reasons given above for respective base claims 1, 14, and 23.

Accordingly, the withdrawal of the rejections under 35 U.S.C. § 103(a) is respectfully requested.

In view of the foregoing remarks, it is respectfully submitted that all the claims now pending in the application are in condition for allowance. Early and favorable reconsideration of the case is respectfully requested.

Respectfully submitted,

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